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(54) **Settling tank with by-pass**

(57) A settling chamber 14 separates oil from drainage water which enters the chamber through inlet 20 and leaves through downpipe 26, but should flooding increase the flow rate then the level in upstream chamber 12 rises, so that most of the water flows over the upturned rim of pipe 32 and bypasses chamber 14. Accumulated oil 22 is periodically removed from chamber 14. In another construction, the settling chamber is annular and encloses the upstream chamber, and in a third construction the upstream chamber and bypass are replaced by a single wide-bore pipe arranged at a higher level than the inlet to the settling chamber.

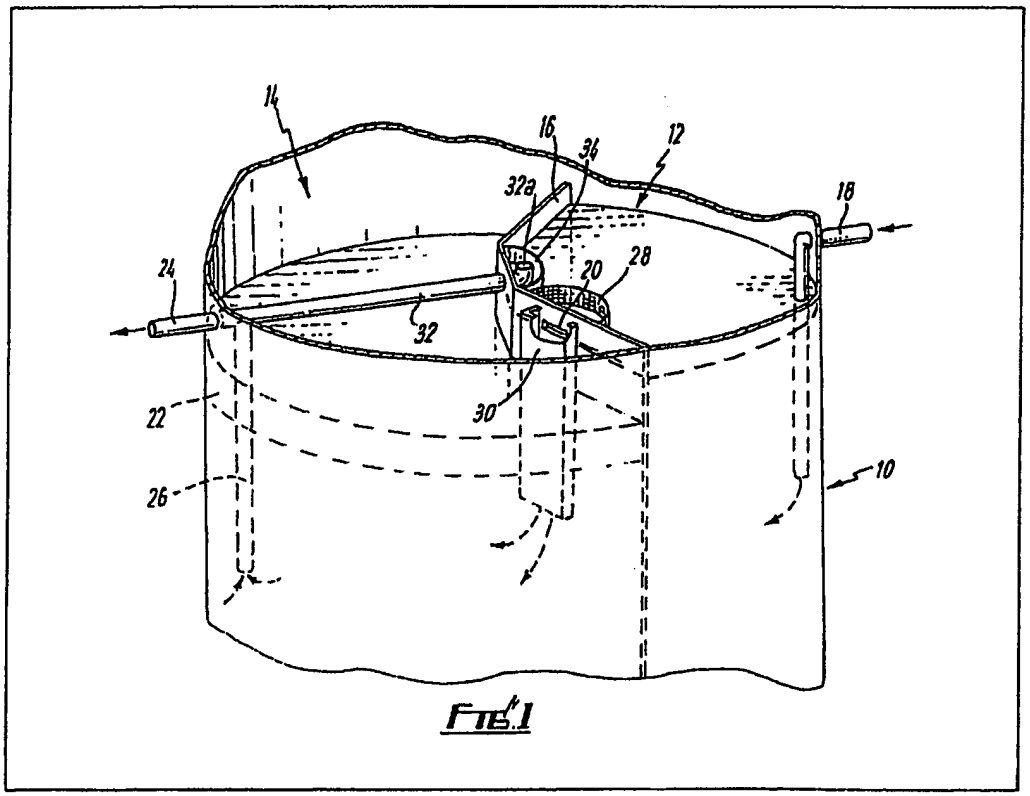


FIG.1

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

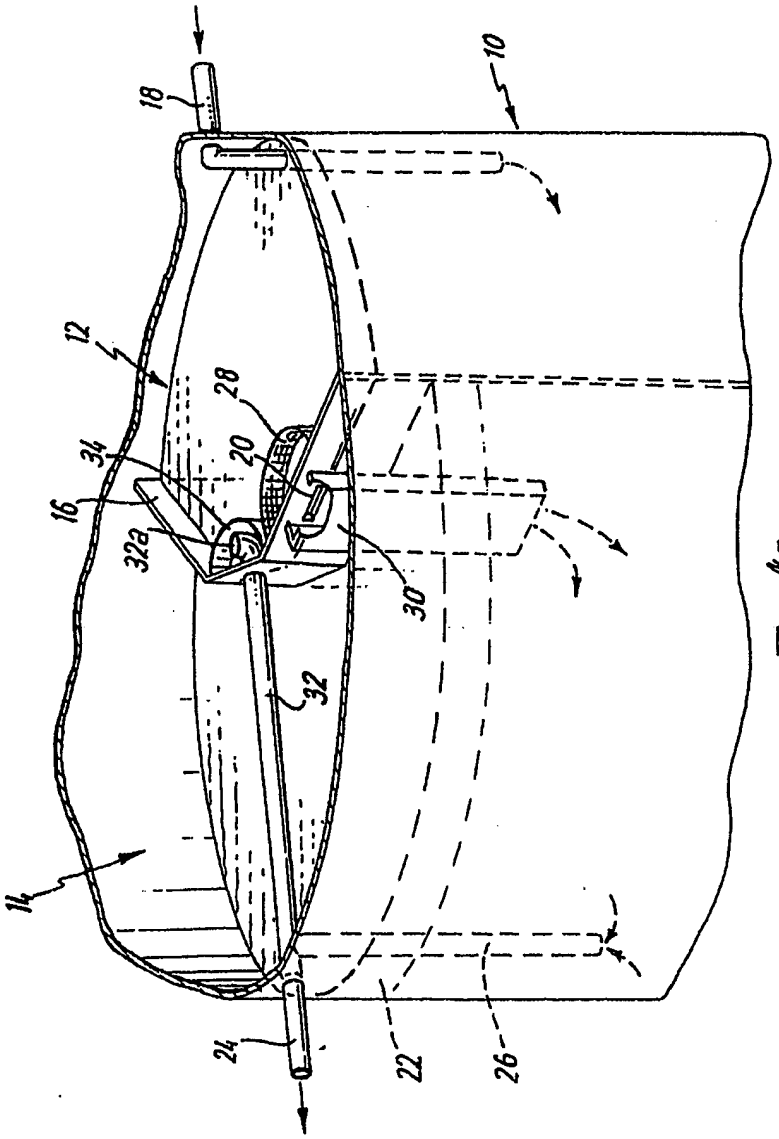



Fig.1

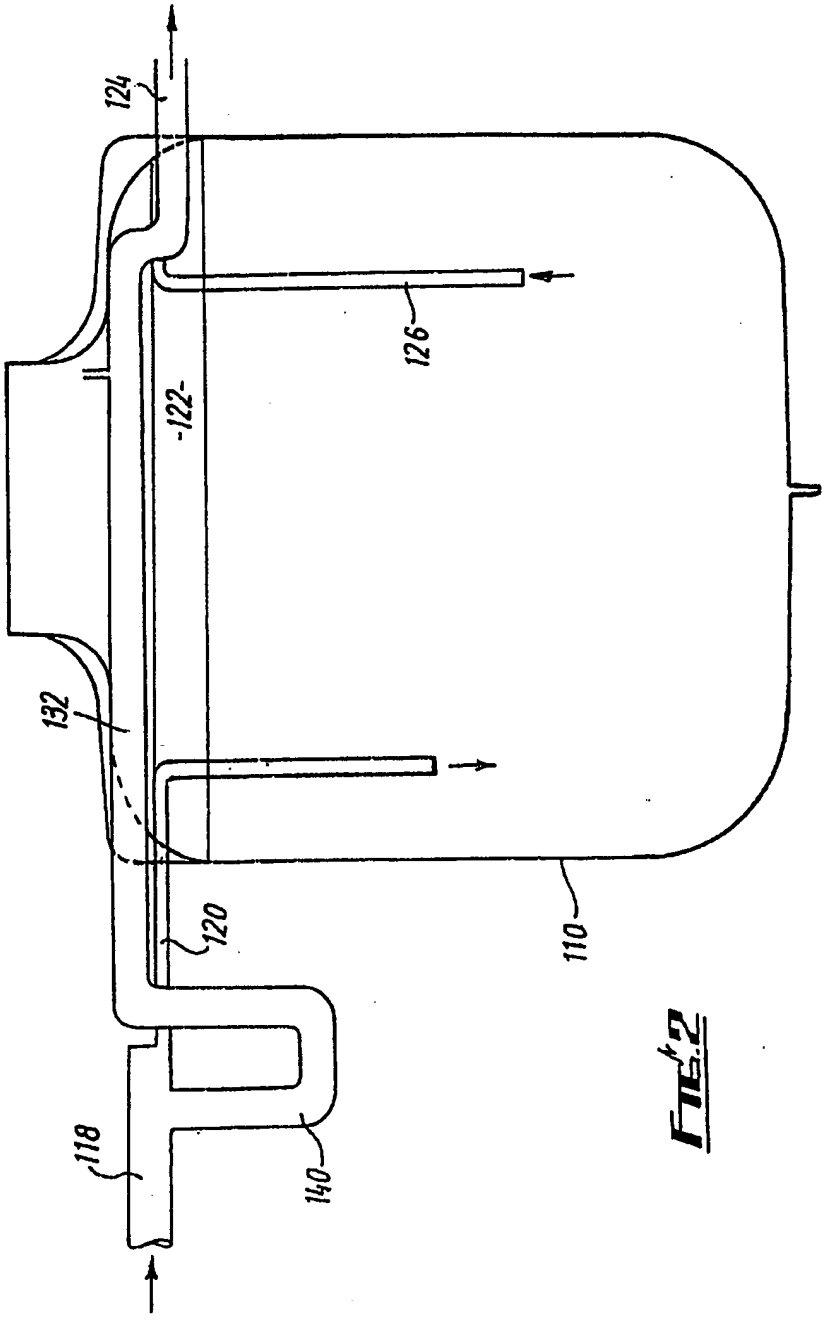
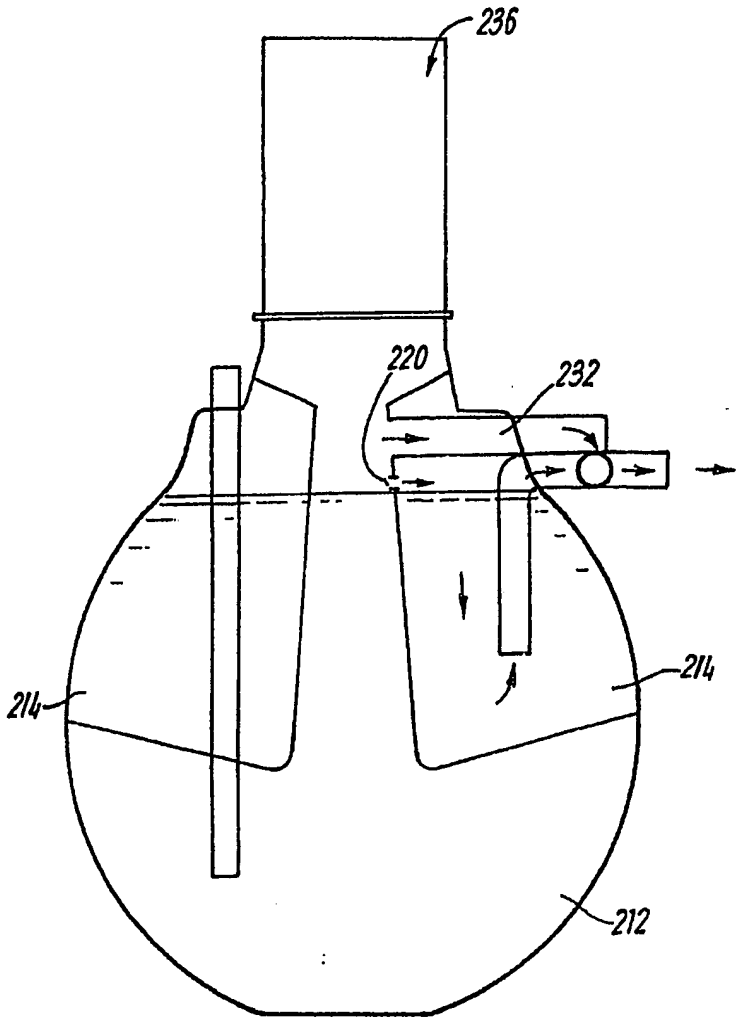



FIG. 2

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SPECIFICATION

## Separation of immiscible pollutants from liquids

The invention relates to the separation of immiscible pollutants from drainage liquids and is particularly though not exclusively applicable to the separation of oil and/or fuel pollutants from rain water drainage systems.

It is known to provide settling tanks and the like for the separation of immiscible pollutants from fluid such as rain water such that the pollutants can be periodically drawn off from the settling tank, the pllutants usually being separable by flotation if less dense than the rain water or by settling if more dense. It is an unfortunate disadvantage of such rain water settling tanks that during flood conditions, any accumulated pollutant may be easily swept from the settling tank into the rain water drainage system by the flood water, damaging water courses such as rivers into which the system drains.

The present invention seeks to mitigate or obviate this disadvantage.

The invention provides apparatus for separating immiscible pollutants from drainage liquids, comprising on inlet for polluted liquid, an outlet, at least one separating chamber wherein pollutant is separable from said liquid, the or each said separating chamber having means whereby said pollutant may be removed therefrom, and overflow means, in use, operable when the flow rate of polluted liquid at the said inlet is less than a given value to supply polluted liquid to said separating chamber or chambers and when the said flow rate exceeds the said given value to allow all or most of said polluted liquid to by-pass said separating chamber.

Preferably the or each said separating chamber has regions at the top and/or bottom thereof where pollutants may congregate and the inlet and outlets are provided by conduits which supply liquid to and remove liquid from other regions of the or each separating chamber between the said regions. The over flow means may comprise an aperture of limited dimensions a conduit leading to said chamber or in a wall of said chamber through which polluted liquids may flow into the chamber together with an overflow conduit at a higher liquid level than said aperture whereby, should the level of water rise above said aperture, said overflow conduit permits liquids to by-pass said separating chamber.

The apparatus may comprise a container divided by a wall into first and second parts the second part providing the said separating chamber and the first part, a first chamber, having the said inlet therein and an entry to said overlow conduit, the said aperture being provided in the said wall.

The apparatus may be made from any suitable material, preferably corrosion resistant materials such as plastics.

Embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings in which:-

*Figure 1* is a schematic perspective view partly cut away of apparatus according to the invention,

*Figure 2* is a schematic cross sectional view of further apparatus according to the invention, and

*Figure 3* is a schematic cross sectional view of yet another apparatus according to the invention.

The apparatus shown in Figure 1 comprises a tank shown generally as 10 divided into a first chamber 12 and a separating chamber 14 by a dividing wall 16. The wall 16 is shaped such that the volume of the first chamber 12 is approximately a quarter of the volume of the separating chamber 14. Liquid is introduced into the apparatus through an inlet conduit 18 into the first chamber 12, under normal circumstances and, when the level of liquid in that chamber is sufficiently high, the liquid passes through a slotted aperture 20 in the wall 16, into the separating chamber 14.

The separating chamber 14 provides for the separation of pollutant and in this chamber less dense pollutant materials float to the top of the liquid and form a layer 22. When the level of liquid in the separating chamber 14 is sufficiently high (i.e. under normal circumstances) purified liquid leaves the apparatus through an outlet conduit 24 via a dip tube 26. The purpose of the dip tube 26 is to prevent pollutant from the layer 22 being drawn out of the apparatus with the purified liquid. It is to be noted that in the apparatus shown in Figure 1 the liquid level in the separating chamber 14 is shown slightly lower than would normally be the case so that the various portions of the apparatus may be more clearly seen.

The pollutant layer 22 is removed periodically by suitable means through an access hatch (not shown) provided in the top of the tank 10 which is normally located underground. The aperture 20 is protected by a semi-circular mesh guard 28 to prevent any less dense materials and flotsam which may collect in the first chamber 12 being drawn through the aperture 20. The mesh guard 28 extends downwardly to a depth slightly greater than the depth of floating material likely to be formed under normal circumstances. A scum guard 30 is also provided in the separating chamber 14 to direct liquid passing through the aperture 20 to a central region of the separating chamber 14 where separation may occur. The scum guard prevents the layer of pollutant 22 being disturbed and entrained by incoming liquid.

An over flow pipe 32 has an opening 32*a* slightly above the normal water level in the first chamber 12 and connects directly with the outlet pipe 24 in common with the dip tube 26 from the separating chamber. The opening of the overflow pipe 32 is protected by a semi-circular guard plate 34. When the flow rate of liquid to the inlet pipe 18 is greater than the flow rate which can pass through the aperture 20 without accumulation of liquid in the first chamber 12, the liquid level in the first chamber 12 rises and eventually the liquid passes into the overflow aperture 32*a* and is directed through the outlet pipe 24, substantially all of the liquid by-passing the separating chamber.

It is to be noted that the aperture 20 is approximately level with the centre line of the outlet pipe 24 and the level of the entry to the overflow pipe 32*a* is slightly higher than this level and level with or slightly lower than the inlet pipe 18. It is also to be

understood that the pipe diameters of the inlet, outlet and overflow conduits are chosen according to the various flow rates to be accomodated by the apparatus. Typically for drainage systems in the United Kingdom the diameters of the various parts will be 102 mm or 4" diameter pipes. Also, the size of the tank 10 is dependent upon the amount of pollutant it is desired to accumulate between removals and the relative amount of pollutant anticipated in the drainage liquid.

Figure 2 shows apparatus according to the invention but different from that shown in Figure 1 and comprising a single non-compartmented tank 110 providing the separation chamber, which is supplied with liquid through an inlet pipe 120 of limited sectional area and from which purified liquid passes out through an outlet pipe 124 by means of a dip tube 126. The apparatus also comprises a by-pass trap 140 which is normally full of liquid and this, together with the conduit 120, are connected to the main inlet 118 for liquid. An outlet side of the by-pass trap connects directly with the outlet pipe 124, by-passing the separating chamber 110. It will be seen that under normal circumstances when the flow rate of liquid at the main inlet 118 is less than the maximum flow rate which can pass through the conduit 120 without accumulation, then the liquid will flow into the separating chamber 110 where less dense pollutants will float to the surface to form a layer 122 and purified liquid will travel out of the chamber through the dip tube 126 and the outlet tube 124. If, however, the flow rate of liquid into the main inlet 118 is greater than the said maximum then accumulation will occur and this will pass through the overflow pipe 132 to the outlet pipe 124 by-passing the separating chamber 110.

The apparatus shown in Figure 3 is similar to that shown in Figure 1 except that the configuration of the tank is slightly different. In the apparatus shown the tank is divided into two chambers as before, a first chamber 212, a central portion of which connects with an opening 236 through which flotsam may be removed and an annular shaped separating chamber 214 surrounding the said central portion of the first part 212. An aperture 220 permits fluids to flow from the first chamber to the separating chamber under normal conditions as before, however should the flow of liquid to too great, then the fluid level in the central portion of the first chamber will rise and flow out through the overflow pipe 232, by-passing the separating chamber 214. An access part (not shown) is provided for the removal of pollutant material from the separating chamber 214.

In each of the apparatus described with reference to Figures 1 and 3 the first chamber provides a trap for stone and silt materials, and flotsam such as pieces of wood.

Various modifications may be made without departing from the scope of the invention, for example the apparatus need not be used for the intercepting of pollutants from rain water but may be used for other liquid mixtures.

The apparatus may be made from any suitable material preferably glass reinforced plastics. Two or more separating chambers may be provided, the chambers arranged in a series.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the application claims protection in respect of any patentable feature or combination of features hereinbefore referred to whether or not particular emphasis has been placed thereon.

CLAIMS (Filed on 12.9.83.)

1. Apparatus for separating immiscible pollutants from drainage liquids, comprising an inlet for polluted liquid, an outlet, at least one separating chamber wherein pollutant is separable from said liquid, the or each said separating chamber having means whereby said pollutant may be removed therefrom, and overflow means, in use, operable when the flow rate of polluted liquid at the said inlet is less than a given value to supply polluted liquid to said separating chamber or chambers and when the said flow rate exceeds the said given value to allow all or most of said polluted liquid to by-pass said separating chamber.

2. Apparatus as claimed in claim 1, in which the or each said separating chamber has regions at the top and/or bottom thereof where pollutants may congregate and the inlet and outlets are provided by conduits which supply liquid to and remove liquid from other regions of the or each separating chamber between the said regions.

3. Apparatus as claimed in claim 1 or claim 2, in which the overflow means comprises an aperture of limited dimensions, a conduit leading to said chamber or in a wall of said chamber through which polluted liquids may flow into the chamber together with an overflow conduit at a higher liquid level than said aperture whereby, should the level of water rise above said aperture, said overflow conduit permits liquid to by-pass said separating chamber.

4. Apparatus as claimed in claim 3, comprising a container divided by a wall into first and second parts, the second part providing the said separating chamber and the first part, a first chamber, having the said inlet therein and an entry to said overflow conduit, the said aperture being provided in the said wall.

5. Apparatus as claimed in claim 4, in which the container is manufactured from a glass-fibre reinforced plastics material.

6. Apparatus as claimed in claim 4 or claim 5, in which said aperture is a slot.

7. Apparatus as claimed in claim 6, in which a mesh guard surrounds said slot in said first chamber.

8. Apparatus as claimed in claim 7, in which scum guard surrounds said slot in said second chamber.

9. Apparatus as claimed in any one of the preceding claims, in which said outlet is a dip tube located below the surface of liquid in said second chamber.

10. Apparatus as claimed in claim 9, in which the diameter of said dip tube is less than the diameter of the inlet so that when excess liquid is supplied to the

apparatus it may flow directly from said inlet to said outlet thereby by-passing said separating chamber.

11. Apparatus substantially as hereinbefore described with reference to any one of Figures 1 to 3 of the accompanying drawings.

12. Any novel subject matter or combination including novel subject matter herein disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims.

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